



Standard Specification for Track-Resistant Black Thermoplastic High-Density Polyethylene Insulation for Wire and Cable¹

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1. Scope

1.1 This specification covers black track-resistant thermoplastic high-density polyethylene insulation. The base polymer of this material consists substantially of polyethylene. Before application to the conductor, the insulation shall comply with the requirements of Specification D 1248, Type III, Class C, Category 5, Grade E10, J4, or J5. The requirements of Specification D 1248 shall not apply to the insulation removed from the conductor.

1.2 This insulation is suitable for use on wire or in cable used for power transmission in overhead spaced-line service, installed at temperatures above -25°C and exposed to sunlight and other atmospheric environments between -55 and $+75^{\circ}\text{C}$.

1.3 Whenever two sets of values are presented, in different units, the values in the first set are the standard, while those in parentheses are for information only.

2. Referenced Documents

2.1 ASTM Standards:

- D 470 Test Methods for Crosslinked Insulations and Jackets for Wire and Cable²
- D 1248 Specification for Polyethylene Plastics Molding and Extrusion Materials³
- D 1693 Test Method for Environmental Stress-Cracking of Ethylene Plastics³
- D 1711 Terminology Relating to Electrical Insulation²
- D 1928 Practice for Preparation of Compression-Molded Polyethylene Test Sheets and Test Specimens³
- D 2132 Test Method for Dust-and-Fog Tracking and Erosion Resistance of Electrical Insulating Materials²
- D 2633 Methods of Testing Thermoplastic Insulations and

Jackets for Wire and Cable⁴

3. Terminology

3.1 *Definitions:* For definitions of terms used in this specification refer to Terminology D 1711.

3.2 *Definition of Term Specific to This Standard:*

3.2.1 *aging, (act of), n*—exposure of materials to air at a temperature of 100°C for 48 h.

4. Physical Properties

4.1 When tested for physical and aging requirements, heat distortion, cold bend, U-bend discharge, and surface resistivity in accordance with Methods D 2633, environmental cracking in accordance with Test Method D 1693, and track resistance in accordance with Test Methods D 470, the track-resistant black thermoplastic high-density polyethylene insulation shall meet the requirements specified in Table 1.

5. Electrical Requirements

5.1 Subject cable specimens to a 5 min ac or dc voltage withstand test at voltages which are based on the nominal thickness of the insulation. Conduct tests in accordance with Methods D 2633 using 125 V/mil (5 kV/mm) for ac tests or 375 V/mil (15 kV/mm) for dc tests.

6. Sampling

6.1 Sample the insulation in accordance with Methods D 2633 and Test Methods D 470, D 1693, and D 2132.

7. Test Methods

7.1 Test the insulation in accordance with Methods D 2633 and Test Methods D 470, D 1693, and D 2132 modified as noted in Table 1, and noted as follows.

7.2 To test for environmental cracking in accordance with Test Method D 1693, test specimens shall be molded in accordance with Procedure C of Practice D 1928 and the test reagent shall be 10 % Igepal CO-630⁵ or equivalent.

¹ This specification is under the jurisdiction of ASTM Committee D-9 on Electrical and Electronic Insulating Materials and is the direct responsibility of Subcommittee D09.18 on Solid Insulations, Nonmetallic Shieldings, and Coverings for Electrical and Telecommunications Wires and Cables.

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² *Annual Book of ASTM Standards*, Vol 10.01.

³ *Annual Book of ASTM Standards*, Vol 08.01.

⁴ *Annual Book of ASTM Standards*, Vol 10.02.

⁵ Igepal CO-630, available from the GAF Corp., or its equivalent, has been found satisfactory for this method.

TABLE 1 Physical Requirements for Black Track-Resistant Thermoplastic High-Density Polyethylene Insulation

Physical requirements (original):	
Tensile strength, min, psi (MPa)	2500 (17.2)
Elongation at rupture, min, %	300
Physical requirements [after aging in an air oven at 100 ± 1°C for 48 h]:	
Tensile strength, min, % of original value	75
Elongation at rupture, min, % of original value	75
Heat distortion at 90 ± 1°C, max, % of original thickness:	
4/0 AWG (107 mm ²) and smaller (insulation on cable)	30
Larger than 4/0 AWG (107 mm ²) (buffed sample of insulation)	10
Cold bend, at - 25 ± 1°C for 1 h	no cracks
Environmental cracking, 48 h	no cracks
U-bend discharge, 125 V/mil (5 kV/mm)	no cable failures or cracks in insulation surface
Surface resistivity, min, MΩ	200 000
Track Resistance:	
Average time to failure, min, h	200

8. Keywords

8.1 ac test; cold bend; dc test; elongation; environmental cracking; heat distortion; high-density polyethylene; surface resistivity; tensile strength; thermoplastic; track-resistant; u-bend discharge

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